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A.V. Bochkarev, A.I. Zemlyanukhin

REVERSE CALCULATION OF
ELASTIC MODULI OF PAVEMENT LAYERS

Abstract. With the adoption of GOST R 59918-2021, assessment of strength of the multilayered pavements should be accompanied by calculation of the elastic moduli of individual layers. The source of information for solving this problem is the deflection bowl of the pavement surface, determined experimentally using a dynamic loading facility. The method for determining the elastic moduli of layers along the deflection bowl is regulated by the specified standard and is based on solving the problem of elasticity theory for a multilayer half-space using integral transformations. Computational complexity of the problem associated with multiple numerical integrations leads to an unacceptably long estimate time, which reduces efficiency of modern high-performance dynamic loading devices. In this paper, it is proposed to use the Shanks transformation in the process of numerical integration, which is used in numerical analysis to increase the rate of convergence of sequences. It is shown that combined use of the Shanks transform, asymptotic substitutions, and parallelization of the computational process helps to reduce the estimate time by more than an order of magnitude.

Keywords: non-rigid pavement, reverse calculation, modulus of elasticity, deflection cup, the Shanks transformation

V.V. Gorbunov, A.M. Karpeev, A.A. Ignatiev

AUTOMATED EDDY CURRENT CONTROL
OF AXLE ROLLER BEARINGS

Abstract. The design, application and technical characteristics of the automatic machine model IP NK-R.01 for eddy current control of rollers to axle bearings for the railroad transport are considered.
Keywords: eddy current method, bearing rollers, automatic control, automatic calibration of sensor sensitivity

E.E. Mirgorodskaya, N.P. Mityashin, Yu.B. Tomashevskiy,
E.V. Tregubova, R.D. Al-Qarawi

APPLICATION OF A FUZZY SET SYSTEM IN SOLVING MULTIPLE
CRITERIA CHOICE PROBLEMS

Abstract. The paper considers the issues related to application of a fuzzy (non-additive) set system used to solve the vector optimization problems under systemic improvement of criteria values when coordinating their research process.
Keywords: multicriteria optimization, system interaction, fuzzy set system, set classes, scalarization, ranking

O.V. Zakharov, A.S. Yakovishin, A.V. Zhukov

APPLICATION OF FILTERS OF ISO 16610-SERIES
FOR SURFACE TEXTURE ANALYSIS.
PART 2. GAUSS PROFILE FILTERS

Abstract. The authors present a second article in the series devoted to application of filters of ISO 16610 standard series used in filtering the profile and surface texture. This article presents an analysis of two standard Gaussian profile filters: linear and robust regression filters. Gaussian filters are the most commonly used and most extensively studied group of filters. Traditionally, the results obtained for the new filters are compared with linear Gaussian filters. The history of creating regression filters, their use for multifunctional surfaces is described. Disadvantages of the filters associated with end effects and methods for minimizing them are considered. Application of the linear Gaussian filter for closed profiles in the analysis of roundness is presented. The focus is made on an effective application area of the Gaussian profile filters.
Keywords: measurement, surface metrology, roughness, filtration, profile filter, Gaussian filter, robust filter

AA.V. Korolev, D.N. Okhlupin, I.V. Sinev, K.A. Avdonin

POLISHING ROTATION PARTS WITH DIAMOND COATING

Abstract. *The article presents the results of experimental studies relating the process of mechanical and chemical polishing of the polycrystalline diamond PVD coating of parts such as bodies of revolution. A cup metal brush is used as a polishing tool that is rotated around its axis, and the workpiece is rotated and moved along the rotation axis. As a result, the roughness corresponding to the polished surface is achieved within a short time. It is shown that the most significant influence on the surface roughness is exerted by the rotation speed and transverse feed of the tool, whereas the rotation speed of the workpiece has a lesser effect.*

Keywords: *polishing, diamond coating, surface roughness, experiment, processing mode*

M.A. Dzharmuhambetova, M.A. Vikulova, N.V. Gorshkov

ELECTROCHEMICAL PROPERTIES OF ELECTRODES BASED ON NANOPOREUS NICKEL HYDROXIDE

Abstract. *This research is devoted to a comparative study of electrochemical properties of composite electrode materials based on $Ni(OH)_2$ of three different manufacturers as an active component with a carbon additive and a polymer binder. Nickel (II) hydroxide powders were preliminarily studied by XRD, SEM, and laser diffraction. Electrochemical characteristics of the obtained electrodes were determined by the cyclic voltammetry method. The capacitance of the studied electrodes based on nickel (II) hydroxides varies from 15,5 to 17 F/cm^2 depending on the morphology and particle size of the base material.*

Keywords: *nickel (II) hydroxide, morphology, electrode, capacitance, supercapacitor*

R.D. Ismonov, I.N. Ganiev, H.O. Odinazoda,
A.M. Safarov, F.A. Aliev

EFFECT OF INDIUM ADDITIVES ON CORROSION RESISTANCE,
HEAT CAPACITY AND CHANGES IN THERMODYNAMIC FUNCTIONS
OF AB1 ALUMINUM ALLOY

Abstract. The paper presents the results of research into effect of indium additives on the corrosion-electrochemical behavior of the heat capacity and changes in thermodynamic functions of the AB1 aluminum alloy. It is shown that addition of indium by 0,5 wt.% increases anodic stability of the initial alloy in the NaCl electrolyte medium. In the «cooling» mode, the temperature dependence of the heat capacity of the aluminum alloy AB1 with indium was established based on the known heat capacity of the reference sample made of copper grade M00. It is shown that with increasing the temperature, the heat capacity, enthalpy and entropy of the alloys increase, while the value of the Gibbs energy decreases. An increase in the heat capacity, enthalpy and entropy of the aluminum alloy AB1 from the amount of indium has been established. In this case, the value of the Gibbs energy decreases.
Keywords: aluminium alloy AB1, indium specific heat, enthalpy, entropy, Gibbs energy, standard (Cu brand M00)

A.D. Fedorov, M.N. Timofeev, S.Ya. Pichkhidze

THE ISSUES OF SEQUENTIAL TITANIZING
AND CASE HARDENING OF STEEL 45

Abstract. The issues of creation a hardening coating by plasma spraying of Ti powder on steel grade 45 with subsequent carburizing in pastes are considered. The properties of coating obtained by measuring microhardness in line with GOST 9450-76, , as well as morphology and structural features of the surface of the samples are studied.
Keywords: plasma spraying, carburizing, 45 steel, induction heating